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The American Biology Teacher

VOL. 5 JANUARY, 1943 NO. 4

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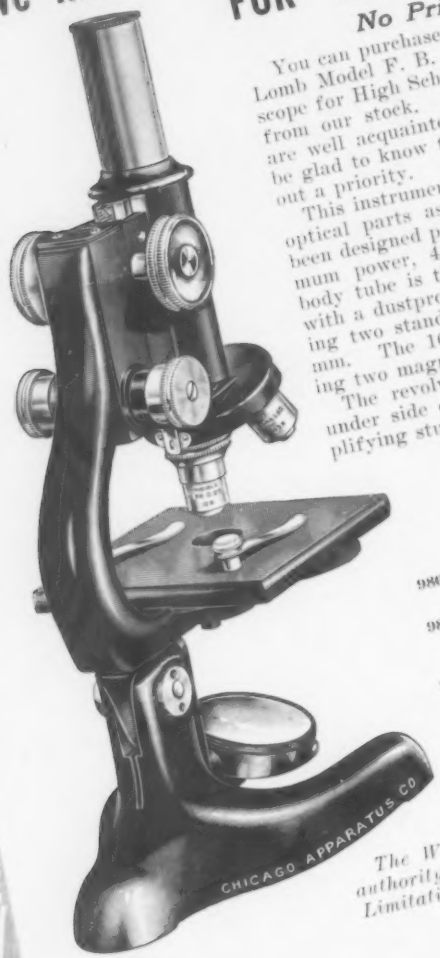

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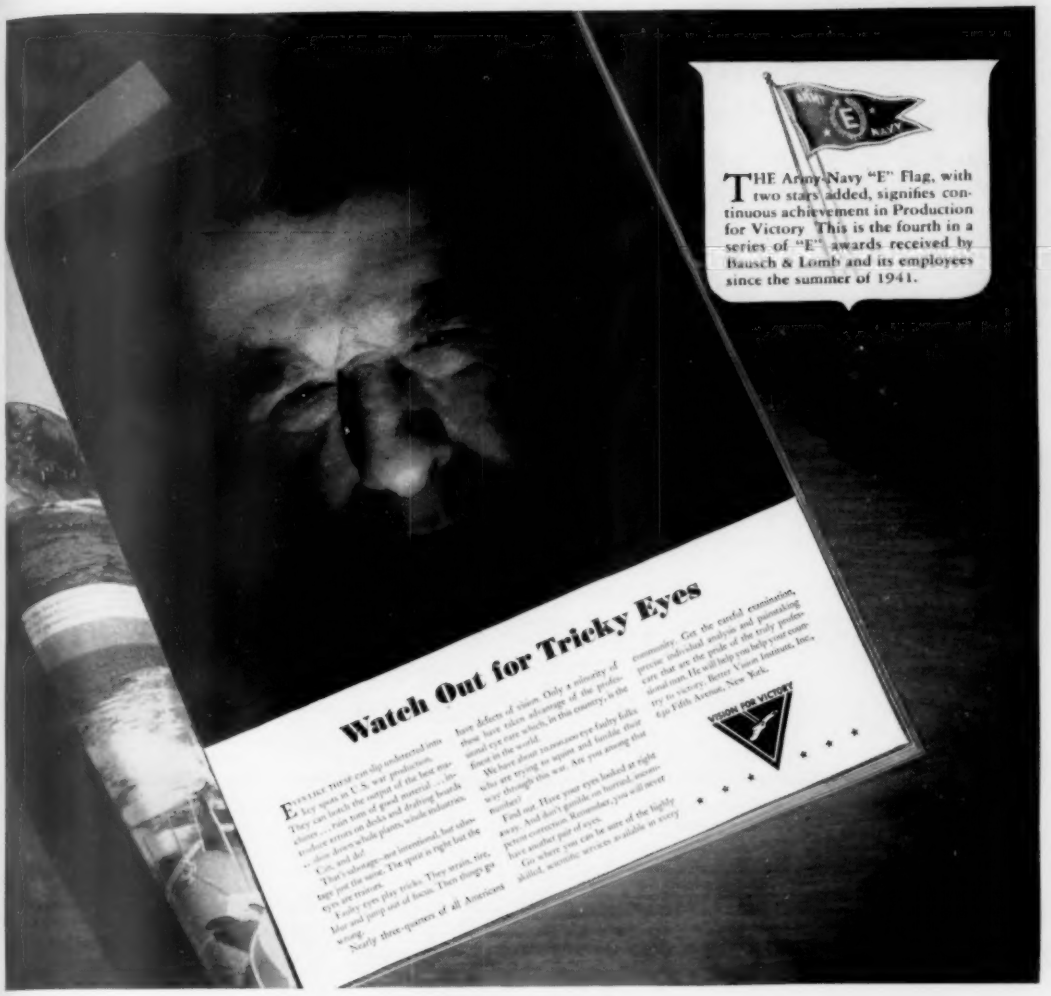
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The American Biology Teacher

Vol. 5 JANUARY, 1943 No. 4

Teaching Conservation in Biology

ELLSWORTH D. LUMLEY
Lincoln High School, Seattle, Washington

No other course in the high school curriculum offers so great an opportunity to teach conservation of our renewable resources as does the course in biology. Here the young people get intimately acquainted with the living world about them and here they should learn the fundamental principles of conservation. It is a gross mistake to teach the identification of living things, their relationship to each other and their manner of life, while at the same time witnessing and ignoring the useless and wicked destruction of these same living creatures.

Today as never before people need to know and understand the value of plants and animals and why so many of our valuable resources are rapidly disappearing. They need to understand and appreciate the "balance of nature" and how far-reaching and costly to mankind one little mistake in wildlife and forest management may be. Students must develop a growing appreciation for living things and this appreciation comes through a more thorough understanding of the dependency of man upon animals and plants.

When studying conservation students will not be learning about old problems which were faced and settled by their parents. They will be studying problems unsolved at the present time, problems which they must face sooner or later, and for which they must help to find the solution. Their ability to cope with these problems will depend not only upon the scientific information they have acquired in their biology classes but also upon the way they have been taught to think and draw conclusions. Here the biology teacher has an excellent opportunity to teach the difference between facts and propaganda. Students should learn not to accept everything in print, but to question the source of information.

Too many publications ("sporting" magazines for example) sold on the news stands ignore the findings of science. Such publications continue to print the theories of unlimited wildlife resources and conservation by destruction.

Given the facts, the average high

school student can find the correct solutions to conservation problems more readily than the average adult. This is because he has not so many pre-conceived ideas concerning natural life and his mind is not so cluttered with pseudo-facts and theories regarding the living world. Neither is he so apt to be influenced by prejudice and by selfish desire for immediate material gain. Youth will think clearly and draw accurate conclusions that remain throughout life.

It would seem that the best and most lasting results will be obtained when controversial problems in conservation are studied. To discuss phases upon which all are agreed will have little effect upon the future behavior of the students and will result in little change in methods of conservation. It is those problems which are misunderstood and mismanaged which need to be covered so that our future citizens will not bungle the problems as other generations have done.

Some of the controversial problems in conservation are so important to the welfare and enjoyment of the nation that they should not be excluded from any biology class. The predatory birds offer a number of separate units. There are the hawks, the owls, the fish-eating birds, the crows and jays. All are birds that man little understands but severely condemns and wantonly kills. During the hunting season the shortage of waterfowl should be studied for here we have a group of birds that have been reduced to a pitiful remnant of their former numbers. The students should learn the reasons for their shortage and what is now being done by our government to restore waterfowl. They also need to know what selfish groups are doing to thwart government conservation agencies. The spring, when many sporting clubs conduct predatory drives, is an excellent time to study the economic importance of many of the mammal predators. The method of conducting these drives needs to be studied along with the judgment of wildlife management authorities in order to determine whether good or harm is to be derived from these predatory drives. Since most of the animals studied in biology are wild animals, a study should be made of the state department which manages this wildlife, probably called the game department or conservation department. It should be noted whether this branch of government is interested in all of the wildlife or just that ten per cent classed as game and whether they have the interests of all the people of the state at heart or just the ten per cent of the population who hunt. The care and proper management of our remaining forests should be studied and the many problems involved presented. The real issues in forest conservation are little understood by the average citizen and yet his welfare depends to no small degree upon proper forest management.

These are but a few of the phases of conservation which may be profitably studied in biology. Of course it means more work for the teacher, for materials must be gathered from any number of sources and this material must be thoroughly understood by the teacher. Considerable time must be spent in class discussions. Differences of opinion will arise between students in the class, and here the teacher will have to suggest further sources of information for one or both parties to investigate.

Conservation may not be easy to teach, but a real teacher finds his reward in seeing his students do straight thinking and then practicing in their daily lives the lessons they have learned. They become ardent defenders of the living resources of America.

Conservation Education and The Biology Teacher

STANLEY SPRECHER
Mitchell Union High School, Mitchell, Oregon

The conservation of our natural resources has long been considered an important topic in both the elementary and the secondary schools. In the high school it has been, and in many cases still is, the duty of the teacher of citizenship classes to see that conservation at least receives mention somewhere in the school curriculum. Science courses, and particularly biology, are being recognized as appropriate places in which conservation instruction can be effectively integrated into the existing curriculum. Separate semester courses on conservation are seldom taught, and in general the idea of adding such to the already overcrowded curriculum meets with disapproval.

Greater recognition of the importance of studying our natural resources and their wise use becomes evident by an examination of the newer biology textbooks. Increased space in these is being devoted to conservation, many having complete units on the topic. Some textbooks writers, however, go to the extent of including topics rather remotely related to the conservation of our natural resources. Social conservation is perhaps more closely related to sociology and economics. But for an understanding of the basic principles behind the conservation of our natural resources (soil and water, forest wealth, wildlife, and the mineral resources) biology classes are being recognized as the logical place in the high school to teach conservation.

Two reasons in support of the contention that biology is especially appropriate for teaching conservation are, first, that the scientific rather than the emotional approach to the problem of resource use is more likely to take place; a second reason is that the biological basis of conservation should be understood if the all-important concept of resource interrelationships is to be grasped. The ecology of man is but one phase of this, and although important, the interrelationships between various resources such as between streams and forest must be clearly understood if an intelligent attitude toward resource use is to be developed.

An attitude of conservation-consciousness toward all resource-use should be the aim of conservation instruction, and not the development of sentimentalism through the "furry and feathered friend" approach. In this respect nature education may differ from conservation education; the two however are inseparable and nature enthusiasts like Anna Comstock have done invaluable work in conservation through nature study. It is necessary to guard against excessive emotionalism and the resulting erroneous concept of conservation. Conservation has come to mean "wise-use" and not hoarding or complete protection which is but one method by which conservation is made possible. Considered from the standpoint of man as the climax species, complete protection has at times proven to be ill-advised.

For the biology teacher, conservation instruction serves as an excellent means by which high school biology can be made into a living practical course. The criticism that biology laboratories are often a morgue of dead specimens can be met by stressing the living environment which is of greatest concern to the student—both in school and in later life. School is intended to serve as preparation for the future, the development of an intelligent attitude toward resource use is therefore of value to both the individual citizen and to the nation in which he is to take an active part as voter, and as resource-user.

In a recent study on conservation education a questionnaire was sent to the Departments of Education of the forty-eight states and that of the District of Columbia. A response was received from all but the state of Delaware. The questionnaire was sent to the Superintendent of Public Instruction who usually filled it out or delegated the duty to some one in his office; in most instances if the Superintendent did not fill out the questionnaire personally it became the work of the Curriculum Supervisor. The following trends in conservation education were indicated by the survey:

1. Conservation education is considered important by all of the State Departments of Education which cooperated in the study. In five states conservation instruction is required by state statute. In most states whether conservation is taught depends upon the individual teacher. This implies that there is considerable variation not only among the states but within any single state.

2. Both the elementary and the secondary schools are considered important in respect to the place where conservation should be stressed. However, most State Departments of Education favored emphasizing it in the elementary grades. These grades too were considered as the best place to build attitudes of conservation-consciousness. The large majority of those replying held that to be effective conservation instruction must be taught in all twelve grades.

3. Integration of conservation instruction into the existing curriculum is greatly favored; separate courses meet with disapproval. Both the social studies and the science subjects were indicated as courses in which such instruction can be effectively integrated. A slightly greater number favored integrating conservation in the science subjects. Both general science and biology were designated as desirable subjects in the high school in which conservation might be taught.

4. Many State Departments have prepared materials on conservation—these are often issued by the State Department of Education in cooperation with the State Department of Conservation. These materials consist of bulletins serving as teacher aids in more instances than those which can be used by the student directly.

(A practical suggestion for anyone interested in securing free and inexpensive materials is to write to their state or the U. S. Office of Education. Various other Federal Departments have excellent materials available also.)

A copy of the questionnaire form used in the survey, on which are tabulated the responses from the State Departments of Education, is shown below:

1. The teaching of Conservation of Natural Resources should have a place in the secondary school curriculum.
   Yes 45 No —
2. Whether or not Conservation Instruction takes place in our state:
   - 10 depends upon the individual teacher
   - 31 is left up to each school system
   - 12 depends upon the recommendation of the state department
   - 5 is required by state law
   - 4 is carried out some other way
3. The greatest emphasis in teaching Conservation in our state takes place:
   - 20 in the elementary grades
   - 9 in junior high school
   - 10 in secondary school
   - 17 considered equally important in all twelve grades
4. Some states have printed materials on Conservation prepared for schools. Check the type provided and available in your state.
   - 30 bulletins serving as *teacher* aids
   - 17 printed materials that can be used by *students*

8 nothing provided by any state department or agency

5. Two types of materials can be used. Check that which you think would be most suitable for the schools in your state.
   18 separate organized units that can be given to the teacher so that Conservation is taught *directly*
   37 materials that can be incorporated into the existing units already established; that is, *indirectly*

6. Conservation Instruction may be introduced into the curriculum in several ways. Please check the way you consider best.
   1 as a separate subject
   31 as a part of an integrated program
   4 incidentally as the teacher desires in any subject
   18 in connection with the social studies
   24 in connection with the sciences
      7 biology
      7 general science
      17 both
   4 some other way

7. At what age do you think Conservation Instruction would be most effective in building proper attitudes:
   3 pre-school
   14 elementary school
   5 secondary school
   34 to be effective should be taught in all twelve grades

NOTE:—The totals in these different questions are not the same due to omissions and incomplete answers on the part of some of those filling out the questionnaire; in some cases more than one part of a single question was checked. The figures appearing above are the actual results from the study and do not take into consideration any implied answers.

EDITOR'S NOTE: Mr. Sprecher is at present serving in the armed forces of the United States. His home address is R. F. D. #1, Plain, Wisconsin.

Pupil Activities in Teaching Conservation

B. L. EYESTONE
Senior High School, Keokuk, Iowa

It is assumed that the advisability of including conservation of natural resources instruction in the curriculum needs no defense. It is also assumed that, where possible, good pedagogy demands the use of student activities. The following activities have been found practical in a situation involving a regularly scheduled conservation class of not over fifteen members, composed of pupils who have had one year of general biology.

In order to follow a seasonal order of unit presentation, soil conservation study is begun immediately upon completion of a general introductory unit. Progressive farmers living near the city are contacted and permission gained to work on a gully in need of control. The county agricultural agent can help in establishing these contacts. If the class is composed of eleventh- or twelfth-graders there will probably be at least two pupils who can get the family car to haul classmates to the scene of the project. Where it is impossible to find transportation for the entire class the remainder can go to a study hall to prepare another assignment and be taken out at the next class meeting.

On our first trip to the gully we spend our time in planning our future work. We discuss such points as the most effective control measures, tools and materials which will be necessary, and where we can get them. Pupils who have cameras

photograph the gully from different angles and those with artistic ability are encouraged to make maps of the area. This photographic record is kept up-to-date as the work progresses and we find that giving the pupils something to do and including them in the picture is an excellent means of motivation.

FIG. 1. Planting seedlings and sloping gully sides. For certain types of activities it may be necessary to divide the class into sections and take the groups out at different times.

As a rule, we spend at least one class period on each of the following activities: sloping the banks; planting soil-binding shrubs; planting willow or cottonwood seedlings in the bottom of the gully and black locust seedlings on the dry slopes; building log and brush check dams where they seem advisable; and sometimes changing the drainage course of the water which has caused the gully. Where this last task proves too big a job for a spade and shovel, we try to get the landowner to help with a team and walking plow. One step should be fencing in the gully so livestock will not eat the newly planted seedlings, and grass will become established on the gully sides. Future classes can complete any necessary work on these gullies or start control measures on others.

The above activities are designed to repair some of the damage done by uncontrolled water and do not, of course, get at the source of the trouble. Where possible, it is better to carry on activities which will *prevent* formation of gullies. Through the county agricultural agent, we have secured the services of technicians from the *Soil Conservation Service* who have staged contour farming demonstrations on hilly farms near town. Favorable newspaper publicity has resulted in these demonstrations being well attended by farmers, so the demonstrations have helped more than just the farms upon which they were staged. The same method could be used in terracing and strip-cropping demonstrations.

FIG. 2. Giving the pupils something to do and including them in the picture adds interest to the work.

The above activities can be carried out during the warmer weather of both fall and spring. In keeping with this plan of making projects fit the seasons, the late fall and early spring are best adapted to the study of game birds and to cover censuses. If given some preliminary instructions the whole class can be handled in the field at one time. Each pupil sketches a rough map of the area that can be seen by walking in a fairly straight line for a quarter or a half-mile, depending upon how much territory is

to be mapped, and upon the size of the class. Better results are obtained if the class works in groups of three or four and the territory is divided among the groups. A simple set of symbols to indicate ravines, woods, brush piles and cultivated fields must be decided upon before the class takes to the field. A later class period is used to put these maps together into one large composite map of the area (Fig. 3).

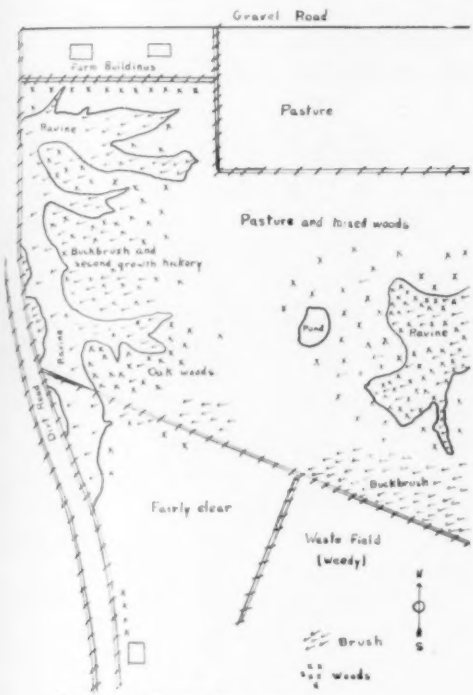


FIG. 3. Composite cover map.

This map will now be useful in determining the need for game bird shelters and feeding stations. If the map shows an abundance of brushy cover and wooded ravines but little food in the form of weed patches and standing small grain, construction of self-feeders is a logical project. Pupils can collect orange crates or nail kegs and can borrow enough tools from the woodworking shop to build these self-feeders in the classrooms. Figure 4 shows a model that is easily constructed.

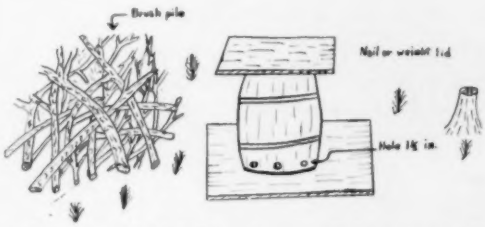


FIG. 4. Self-feeder from nail keg or small barrel.

Before these self-feeders are distributed it is advisable to make a game census. Use the cover map to plan your survey so the most territory can be covered in the least time. If this census is made following a light snow, results will be better since the presence of tracks will indicate where the birds have been ranging, even though none are encountered. Although the accurate censusing of game animals is a task requiring years of experience on the part of trained wildlife technicians, a crude census by the class will show what part of the range is frequented by game birds. Distribute the feeding stations on the basis of these findings.

In our locality we often find that suitable shelter and feed are too far apart to be utilized by game birds. If the cover map shows that there is very little shelter but plenty of available feed, the class can build some brush shelters in the vicinity of weed patches or small-grain fields. Two boys with axes can keep the rest of the class busy carrying brush and sticks and piling them over some kind of crude framework which will serve as a shelter against wind and snow. The shelter should have more than one opening to the outside, or birds may be trapped inside by predators.

Spring is the logical time for attracting song birds to your locality. The

number of available activities along this line is almost unlimited and may involve individual class members or the cooperation of the entire class. Building a colonial house for purple martins is an example of the latter. The work can be planned so that different groups can cut to shape certain assigned parts of the structure. The house can be quickly assembled later if the individual pieces are cut with reasonable accuracy. The completed house can now be located in some favorable spot on the school grounds or in one of the city parks. The resulting publicity will help to sell the conservation course to the public.

If this activity is to be individual work it is best to plan in advance what materials will be needed. Some pupils may want to build rustic houses and may need to make a trip to the woods or to a sawmill to collect slabs and bark. Where this is not practicable, other types of houses can be made from orange crates, shingles, and even tin cans. Farmer's Bulletin No. 1456 entitled *Homes for Birds* is a helpful reference and can be secured from the U. S. Department of Agriculture.

Assembly programs in which class members demonstrate conservation principles provide a means of popularizing your conservation course. For example, the principle of planting vegetation to control soil erosion can be shown by pouring water on an inclined box of dirt in which the surface is bare and on another box in which grass is growing. This plan has been used successfully by Mr. Richard F. Trump of our department in connection with his conservation club. This club has also sponsored assembly programs in which authorities on nature or conservation served as guest speakers.

It is hoped that the preceding points will not only be valuable in themselves but will suggest others, perhaps more applicable to local situations. In choosing activities, select those which can be defended on the basis of contributing to a knowledge of the conservation of natural resources. Avoid those activities which the pupils are able to detect as mere "busy work." A post card addressed to the *Superintendent of Documents, Washington, D. C.*, will bring you a list of the available government bulletins dealing with conservation topics. It might be advisable to obtain some of the more useful bulletins in sufficient quantities for the whole class to use.

A PROJECT IN CONSERVATION

Biology is again demonstrating its versatility. With conservation becoming a major part of our economic life, the biology teacher is presented the opportunity of making the high school course a study of animal and plant life —modern and progressive. In our great agricultural areas where protection of our natural heritages in plant and animal life is a problem a project in conservation is of special value.

The effectiveness of such a project, however, depends upon the location of the school and the resourcefulness of the teacher. Success rests largely upon the latter requirement. Nevertheless, a project carefully presented and detailed can provide the student and the teacher with a knowledge and an appreciation of the biological resources of our country, which will add a distinctly new flavor to the staid structural and functional performances of the laboratory and the field excursions.

Our first attempts in the undertaking were dependent principally upon the method of trial and error. From repeated efforts, we have gleaned a proce-

dure simple and flexible in method; inexhaustible and complete in material. The project is opened through informal classroom consideration of efforts in the immediate vicinity for resource conservation. The general lack of accurate information is soon apparent. This leads to library and reference investigations involving individual reports, or, if possible, group discussions. At least four discussion periods may be profitably used with this procedure. As soon as sufficient material has been presented in discussions and reports to give the pupils a general conception of the object of resource conservation, the appealing phase of the study begins with the construction of models representing the efforts in the various fields of conservation. Popular choices we have found to be the representations of wild life preservation, fish and game reserves, reforestation projects, water and erosion control, and soil conservation if it is not overlapping some other course. Since more specific information will be needed when actual construction begins, additional material may be obtained from the United States Departments of Agriculture and Interior.

The method for representing the project is usually determined by the pupil. Our displays have ranged from elaborate scrap books and museum mounts, to miniature farms completely furnished and a 5′ by $7\frac{1}{2}$′ model map of the United States locating in brief detail the conservations efforts of the United States government. The one requirement we make is that all miniatures must be mounted in either wood or large cardboard bases. These bases frequently require only reducing the sides of a large wooden or pasteboard box. Of course, the soil used in the model of a farm, for example, must be representative of the area; streams, brooks or other locations of water are realistically portrayed with bits of broken glass. Vegetation for the project may be obtained from cuttings of the representative plant dipped in paraffin. The thin covering of wax keeps the vegetation green and life-like. In portraying the animal life, we found modeling clay most adaptable. In the modeling surprising questions of structure arise which give the pupil further practical biological knowledge. The project is limitless in its possibilities, yet it is easily adjusted to a time limit, by the addition or the subtraction of details in the construction of the miniatures. The cost may be controlled by limiting the materials employed. Many of the basic construction materials may be obtained locally at no cost. If museum models are prepared, there is the necessity of buying materials from supply houses.

Aside from the immediate application in the pupils' lives this study provides a quick-moving variance from routine study.

A. J. Ludden,
Junior High School
McCook, Nebraska.

A LETTER FROM MICHIGAN

. . . Does anything less than unity represent equilibrium in the sort of world science has made possible? . . . We are fighting then, not men, but the ideas by which they are obsessed. *If we ever forget that we are doomed to share their insanity.* . . . The enclosed quotation from the Rockefeller Foundation (Ed. note: see editorial on page 84 for this quotation) Annual Report reached my ears via pulpit recently, and started off this train of thought. I think it should be posted on the walls of every biology room. . . . Only as we biology teachers succeed in interpreting biological truth in terms of human values can we be said to rank in any measure with those "who have never served a lesser loyalty than the welfare of mankind." . . .

Yours sincerely,

Jewel L. Atkins,
Detroit, Michigan.

Editorial Comment

CONSERVATION AS A PRODUCTION POLICY

Conservation, reduced to elemental significance, is a policy or principle of controlled production designed to benefit the largest number of people over the longest possible period of time. This concept has been in the minds of conservationists for years.

The present international conflict is serving to intensify and crystallize public opinion and public attitude toward a definite conservation program on a national scale. Such a program is timely and is vital to post-war planning.

Every organization and every agency, both public and private, now concerned with the theory or practice of conservation, is now in a position to advance its individual program to the fullest extent. The rationing program will serve further to intensify this individualized effort at conservation.

Conservation, as a program, to succeed must be planned and executed on a national scale with an international background woven firmly into the very fiber of the program. The advancement of a single conservation program that is not in a harmonious relationship with the over-all picture indicates a weakness in planning.

Cooperative blending, of the best thought, in both principle and practice, from each field of human activity at all levels—local, county, state, and national—will guarantee a balanced program. This program, a concept of conservation as a production policy, must be planned now and taught to teachers. The teachers imbued with an enthusiasm and an interest in the intrinsic merits of the program will be enabled to teach boys and girls throughout the length and breadth of this land of ours the true meaning of the catch phrases, save the soil, protect the forests, and restore our wild game.

The *National Association of Biology Teachers*, with its large and talented advisory staff, is in a position to seek out the best thought from all channels of experience and, with the varied teaching background represented, will be able to unify the thought and action into a teaching plan.

This type of teaching plan will have the advantage of being projected by teachers and educators who are in a position to know the full value of the subject being taught. Ideas and ideals of conservation inculcated in the minds and hearts of young America now cannot but pay enormous dividends in the future.

WILLIS W. COLLINS.

EDITOR'S NOTE: Mr. Collins is serving in the Army of The United States, stationed at present at Fort Sill, Oklahoma.

FOR WORLD UNITY

All biology teachers should take special note of the following quotation from the 1941 Review* of President Fosdick of The Rockefeller Foundation: "If we are to have a durable peace after the war . . . the part that science and advancing knowledge will play must not be overlooked. For although wars . . . may isolate nations and split them into separate units, the process is never complete because the intellectual life of the world, as far as science and learning are concerned, is definitely internationalized,

* Fosdick, Raymond B., *The Search for Unity.* The Rockefeller Foundation Annual Report for 1941, page 9. New York. 1942.

and whether we wish it or not an indelible pattern of unity has been woven into the society of mankind.

"There is not an area of activity in which this cannot be illustrated. An American soldier wounded on a battlefield in the Far East owes his life to a Japanese scientist, Kitasato, who isolated the bacillus of tetanus. A Russian soldier saved by a blood transfusion is indebted to Landsteiner, an Austrian. A German soldier is shielded from typhoid fever with the help of a Russian, Metchnikoff. A Dutch marine in the East Indies is protected from malaria because of the experiments of an Italian, Grassi; while a British aviator in North Africa escapes death from surgical infection because a Frenchman, Pasteur, and a German, Koch, elaborated a new technique. . . .

"Our children are guarded from diphtheria by what a Japanese and a German did; they are protected from smallpox by an Englishman's work; they are saved from rabies because of a Frenchman; they are cured of pellagra through the researches of an Austrian. From birth to death they are surrounded by an invisible host—the spirits of men who never thought in terms of flags or boundary lines and who never served a lesser loyalty than the welfare of mankind. . . .

"Thought cannot be nationalized. The fundamental unity of civilization is the unity of its intellectual life.

"There is a real sense, therefore, in which the things that divide us are trivial as compared with the things that unite us. The foundations of a cooperative world have already been laid. It is not as if we were starting from the beginning."

We know that we must live with Germans and Japanese after the war. We know that these nations are now engaged in a death struggle to force on others a way of living entirely inconsistent with liberty. We *must* therefore defeat them, not *may* or *can*. We must defeat them by force—the only method they understand. We must kill or be killed; we have no other choices.

But, if we wish to retain our way of living, we must *not* permit ourselves to believe that might is the highest right—in so doing we would be losing the war to our enemies, by adopting their basic philosophy. Our enemies are not so much the Japanese and Germans as such. They are the tragic fools who have failed to see that science has remade the world and wish to plunge us backward a thousand years into a "new order." These we must destroy, as we would cut out a cancer, for our own survival and for the peace of the world, including Germans and Japanese.

The biology class offers a fine opportunity for making a contribution to the philosophy of unity. It is easy to show, as indicated by the quotation from Fosdick, that the nations are biologically interdependent, whether they like it or not, even in war time. The implications of this simple truth follow almost automatically.

NEGRO HISTORY WEEK

The eighteenth annual celebration of *Negro History Week* takes place from the 7th to the 14th of February. On this side of the Atlantic the Negro has been a positive force in the advancement of democracy. National attention to this thought will be the theme of THE NEGRO HISTORY BULLETIN throughout the year and the *Negro History Week* posters. The latter are being distributed free of charge. Any one interested may write to The Association for the Study of Negro Life, 1538 Ninth Street, N. W., Washington, D. C.

The War Hits Succotash Biology*

E. LAURENCE PALMER
Cornell University

The war has thrown a few grenades into what our schools are teaching in the entrenched sciences of physics and meteorology. Stream-lined short courses which function promptly to make fliers, artillery men, sailors and weather observers have taken the place of the leisurely presented academic exercises which preceded them.

Biology cannot maintain a business as usual schedule in these times. The succotash biology starting with a diet of the morphology of beans and corn must give way to something else. Any educational activity designed to "prepare one for life" must take into consideration the fact that the life of the average American changed when the Japs showed at Pearl Harbor that they had studied the Sunday morning habits of the American military only too well. From now on and for the duration at least, we are going to live a life of reality, not a life of Riley and intellectual gymnastics. There is nothing academic to the problems faced by a flier dropped in a parachute on a tropical isle, by a sailor washed ashore on an Aleutian beach, by a marine adrift in a rubber boat, or by a ski trooper stranded in the snow on a mountain peak. No one would question the reality which must be faced by a civilian bombed out of his home on a winter's night or a city refugee transferred suddenly away from the delicatessen to a region where he must live off the land. With the lowering of the draft age to eighteen, many of our high school boys will find themselves suddenly living in a new world and for the problems of that new world our biology and conservation courses should give them some preparation. The hilum of beans and the hypocotyl of corn will be less significant information to these boys than how a cat-tail plant may keep them comfortable on a windy, cold, winter's night. We used to dip cat-tail heads in kerosene to use as torches in political campaigns and to dip them in gilt to use as ornaments in art work but this is not the time for art and we cannot yet celebrate any great victory with torch-light parades. Just what does a cat-tail plant mean to you as a biology teacher?

Take the "fluff" from an old head and hold it in your clenched hand. Clench the other hand while it is empty. You will soon notice how warm your fluff-clenching first is when it is compared with the empty fist. Little of the heat escapes through the insulating fluff. Is this academic? Maybe it is unless you find some night that you have to sleep in the open when your feet are likely to freeze. If you do have to sleep this way, take along two pairs of socks, one much larger than the size you normally wear. Fill the larger socks partly with cat-tail fluff. When you get ready to roll into your blankets, work your sock-covered feet down into the fluff in the larger socks so that there is a layer of fluff between the two socks. Now roll in and forget your feet. The chances are they will give you less bother than the rest of your body if the night is cold.

If you happen to establish a semi-permanent camp near a cat-tail marsh, you

* Presented before the Detroit Regional Meeting of The National Association of Biology Teachers, Oct. 10, 1942.

may use the leaves to make a warm bed. Spread a sheet of heavy wrapping paper on the ground and on it place layers of cat-tail leaves crossing them so that no openings appear through the layer. On top of the leaves, put another piece of paper and sew the whole thing together like a coarse quilt. If you have time for making two of these blankets, you will find that they give excellent protection from the cold and may supplement well the old army blanket you may have lugged along with you. The cat-tail quilt can be burned or thrown away when you are through with it but it will help you much on a cold night. A United States patent has been issued for the making of an insulated building board by using cat-tail leaves somewhat as suggested above. The leaves may be woven into a coarse mat or twisted to make a reasonably strong rope if for any reason you should need a rope or a shelter from the weather. If you do not know how to make these things from this cosmopolitan plant, shouldn't the biology of today give some help on the subject?

Of course, when one is stranded in the out-of-doors, it is not enough simply to keep from perishing with the cold and the wet. You must have something to fill your stomach. Well, the cat-tail can help you there. I wonder if you have ever grubbed up the horizontal buried portion of a cat-tail plant. If you have, I know that you remember well the first time you peeled off the muddy covering and gazed at the immaculately white, starch-stuffed interior. If you have a container in which you can boil water, boil some of this starch-bearing part of the cat-tail. Dip out the fiber and boil some more in the same water and shortly you will have a relatively good starchy soup which may be most welcome if you are lost. If you do not like soup, then roast the mud-covered, starch-bearing portions, peel off the caked mud and you will have something which has some nourishing value and is reasonably abundant and easy to get.

If you happen to have to face the world on "nothing flat" during the time of the year when the cat-tails are bearing their pollen-bearing flowers, you may get another kind of food from the plant. These staminate flowers may be shaken off or stripped off into sacks, mixed with water and baked into rather good biscuits. If you think you may be on your own for the duration, you can collect these staminate flowers in quantity, dry them, and use them for flour whenever the occasion arises.

And so we have in this lowly common plant the makings of a whole lot of comfort. Have you explored the other possibilities of the plants to be found in your neighborhood? Did you know that dandelion and mustard greens have twice the vitamin A value of carrots, twenty-five times that of tomato juice, and fifty times that of asparagus; and that strawberries have twice the vitamin A value of canned pineapple and three times that of grape fruit? Now that transportation problems are such that they are wholly involved in the war effort we should begin to investigate more thoroughly the possibilities of our own backyards.

If you wish to explore the possibilities of your neighborhood as a source of food, you will be surprised at what you find. My side yard and neighboring woodland has the makings of some excellent drinks. I can dig the roots of some sassafras and boil it to make a delicious tea. I can steep the leaves of New Jersey tea or the twigs of black birch or the fruit "bobs" of staghorn sumac for a variety of drinks which I would prefer to the more expensive and dangerous stuff to be found on the bars downtown. I can cut the new shoots of brake and other

ferns or of milkweed and have for nothing a delicious salad in the spring. I like to nibble the raw buds of basswood, the fresh tubers of nut-grass, of toothwort and of hog peanut and most of all the seeds of touch-me-not. One of my college professor friends makes a very good cookie of freshly cut grass which he dries quickly and claims has the nutritive value of an equal weight of milk. The greens of our common garden pussley which we throw away are sold in the markets of Spain and Mexico and should be eaten by us. If you haven't tried making greens of cowslip, daisy, lamb's quarters, dock and dandelion then do so. My side yard lawn is full of chicory which for ten years has survived the lawnmower. Because I am somewhat conventional, I try to wipe the stuff out. But because I am also unconventional, I like now and then to reach down and break off the new shoots which spring from the cut plants and eat them raw. The roots of this chicory may be dug, ground and roasted to supplant the coffee which may be absent from the grocery shelves by the time this gets into print.

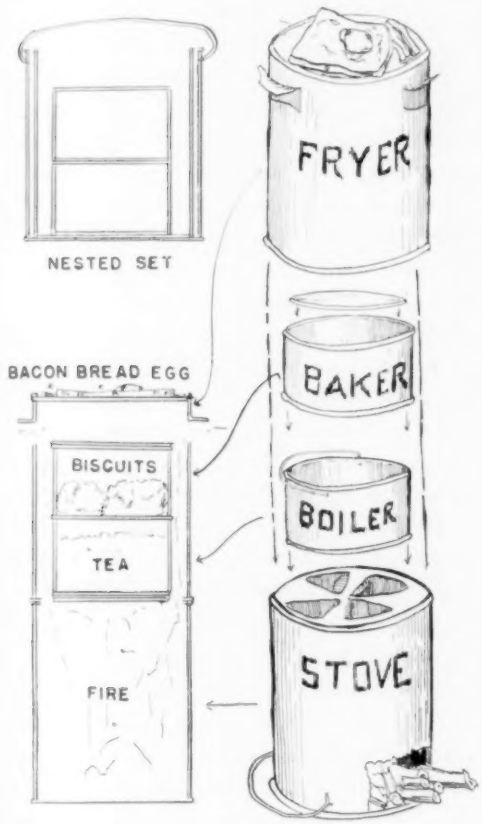
It may sound as though I lived in a naturalist's paradise but I know that the plants I have mentioned are widely distributed because I have seen them in the North and the South, the East and the West. I also have met a host of biology teachers who knew the stages in mitosis who would not know chicory if they met it in the front yard in broad day light. It is possible that the war may blow some of these teachers out of the complacency they have acquired in their years of teaching out of a book.

With the rationing of rubber and gasoline, our picnic hikes are bound to be fewer, or shorter, or more sensible. We are going to learn to travel light. We cannot lug along gasoline stoves, cast-iron grills and Dutch ovens if we are to carry our food and shelter on our backs. As a matter of fact, there never was any need for doing these things. The scouting organizations have developed a series of "tin-can" cooking equipment which many of us have used with varied success. With this equipment, we learn how to boil, to fry, to bake and to roast different foods but as a rule our meal is a long drawn-out process in which one meal is cold before the other is started. Recently, I developed a tin-can cooker which boils, fries and bakes things all at the same time and I have prepared soup, biscuits, bacon and French toast in less than twenty-three minutes from the time I lit the first match and had them all done at the same time.

This combination tin-can cooker uses four tin cans. Two of these are of the Sanka or Kaffee-hag type. One of these is prepared with a simple wire handle. In it, I place water and enough dried soup material to make a good soup. Above this can I place the second coffee can which serves as my oven or for the making of cocoa or a native "tea." The boiler beneath serves as an insulating area and prevents my biscuits from burning. In the baker, I place biscuit dough made after a variety of recipes. Prepared biscuit flour may prove to be the simplest material to use though native flour may be had from such plants as cattails as suggested earlier.

The two coffee cans are placed on top of my "stove" which consists of a gallon oil can which I salvaged from the dump. I have cut out a door about four inches long and the same height into which I can thrust my fuel of pencil-size dry sticks. The top of this stove has been cut crudely to let the heat and flames arise but has a skeleton of tin to support my coffee-can boiler and baker. I now place my stove in position; and on it, the two coffee cans. Now I make my

fryer. This consists of another can about the size of my stove can but deep enough to more than cover my coffee can, and wide enough to allow free circulation of air between. The bottom of this can is open and the opposite end entire. Near this top I cut two flues on opposite sides and about an inch deep and four inches wide. This fryer can sets on the stove over the boiler and baker. On its top, I fry my bacon and my French toast at the same time. I build my fire in the stove and fry the bacon. In the grease, I lay a piece of bread with a hole in it the size of the yolk of an egg. In this hole, I drop my egg; and when the egg is fried firm to one side of the bread, I turn bread and egg together. It should take about five minutes to fry the bacon and egg if you have a good fire or a little longer if the fire does not burn well. By this time, there should have been enough heat in the coffee cans to boil the soup water and to bake the biscuits. You then thrust a stick through the flues in the fryer can, lift it off and there the biscuits and soup are ready to be eaten.



This little stove has other uses worth knowing about if you must live outdoors in bitter weather. If you are cold and the good fuel is scarce, this stove will deliver more heat where you want it than an open fire. Just sit on a log with the stove on the ground between your legs. Light the fire and the heat will stream from the flues directly where you need it. You can even bend over such a fire and use the heat to the maximum. Furthermore, if by accident or otherwise you are in a country where it is important that your fire be not seen by an enemy, the stove shuts off all light above it and only little light shows in the open hearth of the stove.

I have developed a whole series of suggestions for living out-doors, which may be useful to biology teachers. They are in the *March, 1941,* issue of the *Cornell Rural School Leaflet,* which is still available for distribution. These suggestions cover the problems of camp sanitation, wholesome water supply, noxious and poisonous plants and animals, the study of any of which should have a place in a course in high school biology designed to help a high school student live now. The *March, 1943, Leaflet* will deal with a more thorough survey of native plant and animal sources of food than has been given before in this series. Current periodicals have been giving this subject more than usual recognition and you may care to supplement these with such bulletins as *Indian Lore and Indian Gardens* by Melvin R. Gilmore and William G. Vinal's *A Nature Guide's Dic-*

tionary, both published by the Slingerland-Comstock Company of Ithaca, New York.

The viewpoint which has been suggested here may serve to help civilians and combatants meet very real problems of the immediate future. Guides to help one live comfortably off the land should be prepared and attached in waterproof containers to every parachute, life-boat and life-preserver which is issued to our trained military personnel if we desire that they remain long in the effective list. What good does it do to train an aviator how to fly a plane and then dump him into a jungle without any suggestions as to how he can get back to a base safely. How will a shipwrecked sailor know what can be eaten safely from the shore and how much of it can be captured and prepared for eating? These are a few of the problems which are essentially biological which may be more real to the boys and girls of your classes than most of the orthodox succotash you fed them about peas and beans during the last few years. If you are willing to make the adjustment in your program for their sake, you may find that you yourself may get more enjoyment from your own neighborhood than you dreamed was possible. Anyway, it is worth trying.

Conservation

ARTHUR H. BRYAN
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Biology teachers in high schools assume social civic responsibilities to their community in giving students adequate instruction in the conservation of our national resources. Teaching units should include forestry and forest conservation, the economic importance of fisheries and marine life, game and bird life conservation, economic importance of plant and wild life.

Local problems should be given special treatment. For example, here in Maryland we have our natural heritage, the Chesapeake Bay. Conservation and biological laws to protect our fisheries, oysters and blue crabs are vital and should be included in all biology courses of study in the state.

Mr. Harold L. Ickes, Secretary of the Interior, gives this definition: "Conservation means the prudent use of our natural resources without waste or needless destruction, and having in mind always, that, so far as not inconsistent with our own needs, they should be preserved for the use and enjoyment of future generations." In other words, by conservation, we don't mean to stop hunting definitely; but, to limit it so that the animals are given a chance to multiply and serve us indefinitely.

Another definition of conservation is that it is a policy of governmental regulation of the use and development of the natural resources of the country, so as to prevent waste, exhaustion, and destruction by private ownership.

It isn't always the sportsman who ruins game, but, it is sometimes private industries. Not long ago a law was passed bringing court action against anyone or any company discharging wastes into navigable waters. Many factories discharged their wastes into streams and killed the fish as well as the animals that drank of the water. That is one of the many reasons why we need conservation laws today.

At the beginning of the nineteenth century there were millions of buffalo on our western plains. Today there are less than 5000. When the pioneers moved westward, they used the buffalo for food and clothing; if the buffalo had been used for that alone, we might have vast herds still roaming our plains. The people of that day, however, did not look ahead, and they were wasteful. If a trainload of people happened to see a herd, the train would stop long enough for the passengers to kill some buffalo, whose dead carcasses would be left lying to rot or to be eaten by wolves. Sportsmen would see how many they could kill a day. "Buffalo Bill" Cody killed 107 in one day while his opponent killed 75. They did not think about the future.

Far more dangerous to our wild life are the people who don't care. They use unfair methods to destroy game. As an example, some men used a machine to kill antelope. One would drive and another would shoot. What chance does an antelope have against an automobile, unless the auto runs out of gas? A few so-called sportsmen used a corral and rounded up deer. This is unfair, not only to the deer but to all of us.

They might ask, "What is the difference between killing wild game and domestic animals?" There is a lot of difference. Domestic animals belong to someone who paid money for them; wild game doesn't belong to one person, but to all of us—they are a part of America.

A few people might ask, "Why conserve game? What good is it? Is it worth spending millions on?" To answer this look at the industries wild life supports in the field of sport alone. Hunting magazines and sporting goods companies employ people, and the money invested in them mounts into the millions. In other words, game supplies many people with sport as well as with clothing and food to use and sell. If we don't do something to preserve the game, and if we don't put a check on people who don't think or don't care, soon there well be no game, and no industries which depend on them.

The government has long realized that conservation was needed, and has acted accordingly. Game laws have been made very strict. This however is not enough. Our wild life must be given a natural environment in order to reproduce properly. Forests have been cut down and land has been cleared, thereby destroying the natural homes and breeding grounds of our wild game. Realizing this the government has set aside various game refuges in our national and sate forest reserves. Until 1937 we had but 106 game refuges, 19 major waterfowl areas, and 13 secondary refuges and nesting grounds, making 181 refuges in all, totaling 3,336,000 acres.

Since then 55,170 acres in Minnesota have been set aside as a waterfowl refuge, and 103,000 acres in North Dakota for the same purpose.

In Lake County, Oregon, a 276,000-acre summer sanctuary has been obtained, so it was necessary to obtain an adjoining winter range in Nevada almost twice that size.

The government has not only set aside these refuges but also has an efficient organization, under game wardens, to see that these laws are obeyed. These wardens have just been granted the privilege of owning and operating airplanes, so that they can patrol larger areas, more quickly.

Restocking the forests with game is another good job that the government is doing. A 300-acre tract at Natural Bridge, Va., is being stocked with deer, turkeys, grouse, and quail. This is only one example.

In the last few years, the United States

Bureau of Fisheries has produced more than eight billion eggs and young fish yearly.

Besides protecting and producing wild game, the government has spent a lot of money in order to make America "Conservation Conscious." It has printed pamphlets; it has had speakers over the radio, and address public gatherings; and, it has had newspapers write articles on conservation. Each year, the taxes collected on firearms and ammunition are spent on conservation. It is not spent in vain for the Biological Survey shows that wild life has stopped decreasing, and is showing a small but sure increase. The government is doing its part; it's up to us to do ours.

Field Trips with Fun

ELMO STEVENSON
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JOHN: "I don't know."

MR. ——: "Well, John, that put you at the tail end of the line. Mary, you're next."

MARY: "It's a barberry!"

MR. ——: "Correct. Did you know that the original blonde dye originated from the bark of this shrub? Vernon Quinn in his book on *Shrubs in the Garden and Their Legends* relates how the bark of the barberry was used in the Elizabethan days by the ladies of the court and elsewhere as a dye for blonde hair. Blondes were favored by the gentlemen at that time. The berries make excellent cordial and jelly. Furthermore, the drug, lycium, is made from the shrub and used in medicine. Are there any questions?"

RUTH: "Mr. ——, why is the shrub called barberry?"

MR. ——: "Who knows? Jane?"

JANE: "Well, you can see the berries, and if you'll look at the stems you will see three pronged thorns or barbs. Put the two together and you have it."

MR. ——: "Let's proceed. Mary, what is this shrub?"

MARY: "Mother calls that a sarvice berry."

MR. ——: "That is the name the pioneers gave the shrub. However, the correct spelling is 'service.' These oldtimers used the long 'a' in many of their words. For example, bears were called 'bars,' and so on. The service berry is called the June berry in the middle states, and by other names elsewhere. Its berries make excellent jam, and many a pioneer has staved off starvation by consuming the fruit. Try them!"

JIM: "They're kind of sweet and rather seedy. What family of plants does the shrub belong to?"

MR. ——: "The rose family. This family provides us with many aesthetic and commercial plants—most of our fruits such as the cherries, apples, etc. Let's move on or we'll never get around the school building. Mary, what is this plant?"

MARY: "I don't know."

MR. —— "John?"

JOHN: "I don't know."

No one knew, so the instructor told the young people that it was the syringa or mock orange. He said that the shrub when in blossom has nearly the fragrance and beauty of the orange blossom, which is commonly used in nuptial ceremonies.

Syringa is often used as a substitute. The narrow straight shafts of the bush were often used by the Indians for arrows.

The above is a portion of the discussion and procedure that occurred on a fall field trip in biology about the high school grounds. Besides playing this game of *Heading the Line* for about half an hour, the group played *Matching Leaves* for the remainder of the period. The end achieved was the recognition by the students that they knew few of the cultivated plants and little about them. They also discovered that they needed aids for the identification of the common landscape plants. This is exactly what the teacher wanted to accomplish. The trip about the high school grounds on which the games were played was designed to be an introducton to a unit on taxonomy.

To play *Head the Line* the students are arranged in single or double file. The leader halts frequently and asks the person in front to identify the object pointed out, which may be near or far. If this person fails, he goes to the end of the line and the second person has a turn. If this person fails, he or she goes to the end and so on down until the answer is given. The one who remains at the front longest wins. Instruction is best given at the halts and is usually called for by the questions of the players. Correct answers may be drawn from the student by skillful questioning.

The second game played by the class on this field trip was *Matching Leaves*. The class was divided into two sides and instructed as follows: "You will be given just one moment to gather as many different kinds of leaves as you can. Only one leaf may be taken from each plant. At the end of the minute each team will gather under the leadership of the captain of that side, and there select one leaf of each different kind assembled by that side. All duplicates are discarded. Then each member will be handed one of the selected leaves in turn until that side's supply is exhausted. The side should name as many of the leaves as is possible. The teacher will help the side when it has exhausted its own resources. When this has been done the two sides will line up facing each other. Each member of each side will then in turn, alternating between the sides, hold up a leaf and give its name if possible. If some member on the opposing team has a leaf that matches the declarer's, he must indicate it. A point is given to the side whose leaf is not matched by one from the opposite side. The side having the greatest number of points when all species of leaves have been shown wins."

This game of *Matching Leaves* illustrated to the class how few of the local plants they knew. A month later both games were played as a concluding activity to the unit on taxonomy. Nearly all members of the class had become familiar with the common garden plants. Those that were unknown were quickly determined through the use of keys which the class had developed during the unit.

These games show the potentialities of the play method of instruction on the biology field trip. There are many more such games, most of which can be secured from the sources indicated in this article. The alert teacher will invent his own to fit his particular needs.

On long field trips the hiking to and from the place is usually the least interesting and most irksome part. Then too, if the hike is a long one, resting periods are a source of grief and unrest to the more enduring physically and mentally. Usually nothing worthwhile is accomplished at this time; petty mischief or serious problems may arise to counteract the benefits of the trip. The problem is

to utilize this surging, undirected energy in an instructive, "fun" way, with the emphasis on doing. Busy students always have an interesting time, and the instructor a peaceful one.

Legs and Whiskers and *Roadside Cribbage* are two good games to play en route. The aim of the former is to acquaint the student with the locomotive features of various common animals through accurate observation. This game results in the students learning the habitats and organs of the organisms discovered en route, and getting fun out of it.

In *Roadside Cribbage* small groups work out a list of six to eight objects to be looked for en route and attach to each a rating as: each bird's nest—2 points, each wild animal track—2 points, etc. Only the person who observes the object first can score for his side. Sometimes one point is given to the observer and another to the namer. The instructor says nothing unless he is asked for help. He is the umpire and occasionally gives information or asks questions which lead to a solution. *Holding the Front* is a good trail game.

While the hikers are resting, *Blind Feeling, Blind Smelling,* and *Blind Tasting* are result-producing games. The object of the games is to identify nature objects through the senses. For example, in *Blind Feeling,* the players are blindfolded one by one and led to from six to ten trees which they attempt to identify by feeling the bark. A point is given for each tree identified.

A good game for summarizing and reviewing the objects seen on the field trip is *I Saw.* The players are seated in a circle. The one who is to start the game is determined by drawing, guessing a number, or any such scheme. The starter names an object which he observed somewhere on the trip and describes it briefly. The second player mentions that object and adds one observed by him with a brief description. For example. "I saw a valley oak (mentioned by No. 1) and a dwarf maple which had greenish flowers." The succeeding players mention these in order, adding a new one each time. Those who miss or mention as new anything previously named must perform a stunt or pay a forfeit.

In *Prove It* the procedure is the same except that the players do not describe the objects unless challenged by a player to *Prove It,* whereupon the announcer must describe the object to the complete satisfaction of the group or teacher. If the player can not prove that he saw the thing mentioned he must pay a forfeit or perform some stunt. The game may be made more interesting by having the challenger pay a penalty if the announcer proves his point. This eliminates many foolish interruptions. This game often improves recognition of distant objects.

The play and competitive methods of instruction hold an important place on the field trip as well as in the class room. They may be used to introduce, develop, or conclude an instructional unit. When using such methods, the teacher will find that the students' interest will be gripped; that they can learn, for each game described above either adds a new thought or fact, or leads to a better understanding of the given subject; and that these methods produce as a by-product what boys and girls want—fun.

These games and many similar ones may be found in the following references:

E. L. Palmer, *Nature Games* (leaflet), Comstock and Slingerland Pub. Co., Ithaca, N. Y., $.25.

Chas. F. Smith, *Games and Recreational Methods,* revised, Dodd, Mead and Co., N. Y., $2.50.

E. N. Stevenson, *Nature Games Book,* Greenberg Pub. Co., 67 West 44th St., N. Y., $2.50.

W. G. Vinal, *Nature Guiding,* Comstock Pub. Co., Ithaca, N. Y., $2.00.

W. G. Vinal, *Nature Recreation,* McGraw-Hill Pub. Co., N. Y., $3.00.

PROPOSED CONSTITUTIONAL AMENDMENT

The Chicago Biology Round Table has proposed an amendment to the constitution of THE NATIONAL ASSOCIATION OF BIOLOGY TEACHERS. The submitted change would add to Article IV, Section 1 (the section dealing with the makeup, duties and powers of the executive board) the following statement: "The executive board shall be empowered to adjust the amount of membership dues as necessary to cover the cost of the journal and the operation of the association."

A detailed explanation of the proposal will be printed in the February issue.

According to Article VI, Section 1 of the constitution, "An amendment to this constitution may be proposed by an affiliated chapter of biology teachers. Such proposed amendments shall then be published in the official journal or by written notice to all members at least sixty (60) days before being voted upon by the Representative Assembly. Such proposed amendments shall also require a favorable vote of two-thirds (2/3) of the members present and voting."

Section 2 of this Article states that "any member or group of members may submit his or their written opinion on such proposed amendments to the secretary-treasurer at least ten days before being voted upon by the Representative Assembly. It then becomes the duty of the secretary-treasurer to make available to the members of the Representative Assembly for their consideration those opinions that have been submitted prior to being voted upon."

Biological Briefs

VOEGTLIN, CARL. *Present Status of Research in Cancer.* American Journal of Public Health 32: 1018–1020. September, 1942.

It is common knowledge that the crude cancer rate is increasing, a fact largely accounted for by the increase in longevity resulting from a better control of other diseases. The risk of cancer increases with age. There are now about 450,000 cancerous persons in the United States, and 150,000 annual deaths from the disease. We are now certain that cancer is not caused by a specific organism, although it is possible to produce it experimentally by transpants of living cancerous tissue between animals of the same hereditary constitution. Cancer may be induced by excessive exposure to X-rays, radium, or ultraviolet light, or by repeated contact with various chemicals, including some coal-tar derivatives. When cancer has thus been produced, further contact with the causative factor is no longer necessary for its continued growth. It may be that naturally occurring cancers are caused by chemicals produced within the body; large amounts of female sex hormone may induce cancer of the breast in animals. Furthermore, it is fairly well established that cancer is not a single disease but a group of diseases with some characteristics in common. The growth and physiological effects of cancerous tissue are being analyzed biochemically. Its growth rate can be greaty reduced in animals by diets low in essential components, such as certain amino acids or vitamins; this may soon have its application in the diet of cancerous persons. It is also being discovered that the growth of cancer has widespread effects on the biochemistry of the body as a whole.

THOMAS, EDWARD S. *Nature Points the Way to Wartime Camouflage.* Fauna 4: 34–40. June, 1942.

The principle of camouflage is not being publicized so widely in the present war as in the last, perhaps because its value is more universally known and accepted. Protective animal coloration must have developed as soon as sight was acquired, but although outstanding examples must have been known to man since earliest times it remained for an artist, Abbot H. Thayer, to analyze some of its fundamentals in 1896. His description of the principle of countershading which tends to make an animal appear flat has become known as Thayer's law. This has been attacked, but certain exceptions only tend to support it. Thus large animals which need fear no predators are not countershaded, and those which mimic inanimate objects or which exhibit warning coloration are not so concealed. Thayer's second contribution was an exposition of the laws of concealing markings which make the animal look like its background viewed slightly out of focus, and of ruptive markings which distort the outline of the creature. A recent work entitled "Adaptive Coloration in Animals" by the British naturalist Hugh B. Cott brings together an enormous body of facts in support of Thayer's main tenets. Dr. Cott is, incidentally, applying them in the British camouflage service.

Fungi Fight Disease. Science News Letter 42: 147. Sept. 5, 1942.

From a fungus living in the earth and from one in stable manure, two new germ-stopping chemicals have been isolated—fumigacin and clavacin. The latter is capable not only of inhibiting germ growth, as other such chemicals do, but of killing bacteria. Further research will determine the efficacy of such substances in treating such infections as diphtheria and tetanus.

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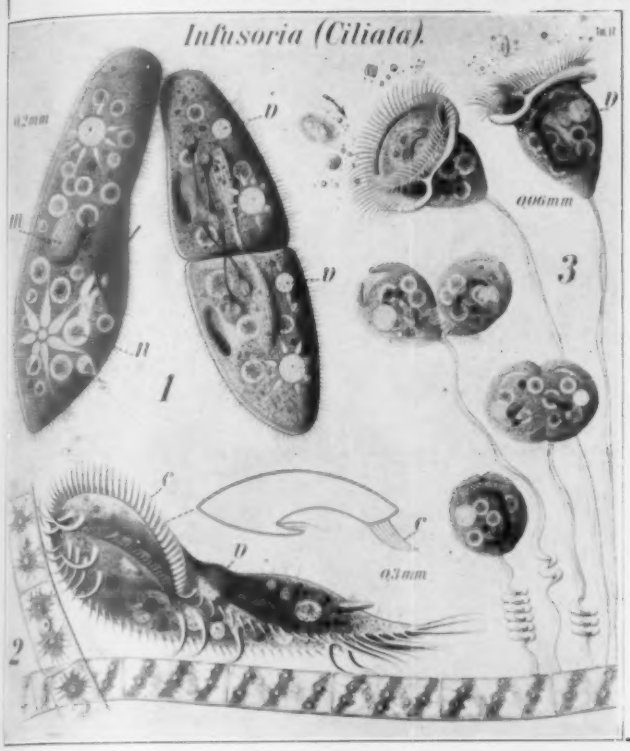

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